Ohio Agricultural Experiment Station.

BULLETIN 82

WOOSTER, OHIO, AUGUST, 1897.

FIELD EXPERIMENTS WITH WHEAT.

COMPARISON OF VARIETIES.

CULTURAL INVESTIGATIONS.

The Bulletins of this Station are sent free to all residents of the State who request them. Persons who may receive duplicate copies, or who do not care to receive any, are requested to notify the Station. All correspondence should be addressed to

EXPERIMENT STATION, WOOSTER, OHIO.

NORWALK, OHIO:
THE LANING PRINTING CO.
1897.

ORGANIZATION OF THE

OHIO AGRICULTURAL EXPERIMENT STATION.

BOARD OF CONTROL.

SETH H. ELLIS	Springboro
R. H. WARDER	North Bend
J. T. ROBINSON	Rockaway
THE GOVERNOR OF THE STATE THE DIRECTOR OF THE STATION	*Ex officio*

OFFICERS OF THE BOARD.

SETH H. ELLIS	President
R. H. WARDER	Secretary
PERCY A. HINMAN	Treasurer

STATION STAFF.

CHARLES E. THORNE	Wooster	Director
WILLIAM J. GREEN	"	Horticulturist and Vice-Director
J. FREMONT HICKMAN, M. A. S	"	Agriculturist
FRANCIS M. WEBSTER, M. S	"	Entomologist
AUGUSTINE D. SELBY, B. Sc	"	Botanist and Chemist
LLOYD M. BLOOMFIELD, B. AGR	"	Assistant Chemist
CHARLES W. MALLY, M. Sc	"	Assistant Entomologist
PERCY A. HINMAN	"	Bursar
WILLIAM HOLMES	"	Foreman of Farm
CHARLES A. PATTON	"	Ass't Foreman and Meteorologist
W. A. PORTER	"	Salesman
DELBERT A. CROWNER, B. Sc. AGR	"	Dairyman
ANNIE B. AYRES	"	Mailing Clerk
S. J. BLAKE	"	Mechanic
W. E. BONTRAGER	"	Foreman of Greenhouses
J. E. BARCLAY	Neapolis	Supt. Northwestern Sub-Station
EDWARD MOHN	Strongsville	Supt. Northeastern Sub-Station

The Bulletins of this Station are issued at irregular intervals. They are paged consecutively, and an index is included with the Anuual Report, which constitutes the final number of each yearly volume.

BULLETIN

OF THE

Ohio Agricultural Experiment Station.

NUMBER 82. AUGUST, 1897.

FIELD EXPERIMENTS WITH WHEAT.

BY J. FREMONT HICKMAN.

INTRODUCTION.

Since the removal of the station from Columbus to Wooster no results of experiments with varieties of wheat have been published, except a few brief newspaper bulletins and circulars, giving comparative yields of the several varieties grown each year. It is expected therefore that this bulletin will include such parts of the wheat work of the last four years as are of sufficient interest to justify a record. Some parts will of necessity be left out altogether, for the reason that only negative results have been worked out; other parts will need confirmation. The subject matter will be treated under two general headings: I. Comparison of Varieties, and II., Cultural Investigations.

I. COMPARATIVE TESTS OF VARIETIES OF WHEAT.

Our list of differently named sorts of wheat now numbers two hundred and seventy-four. It is not practicable to include all this list in a comparative test. The land set apart for varieties gives space for sixty each year. Nearly every year some of the less promising sorts are dropped out and new varieties, or at least newly named ones, are introduced into the list. By this process of dropping out and taking up the first three tables include and deal with eighty-four varieties. In variety testing we have followed the plan of using one variety as a standard of comparison. This variety is grown upon every third plot, and the sorts growing between these plots are compared with this standard variety. I find that most readers of our bulletins on comparison of varieties make the mistake of comparing one sort with another, instead of comparing the yields with the standard kind growing next or nearest to them. In most if not all of our earlier work in this line we made the mistake of

conducting our experiments without the duplicate standard plots, believing, as we did, that it was fair to compare directly plots that were in the same field, even though widely separated in location. This was only approximately fair, and later experiments indicate that the present plan is much more satisfactory and admits of a clearer and better defined comparison. Differences in soil productiveness seem to be better eliminated in the comparisons made in this way than by any other known method.

Table I includes forty varieties that have been grown continuously for four years. It also includes the yields of the standard variety grown next to them for each of these years. On account of the dropping out of some and the introduction of other varieties, the same sorts have not occupied continuously the same relative positions each year. Owing to this condition it has been necessary, in order to make the comparison more clear, to record the yield of the standard sort after each variety, except where the same kinds have occupied the same place for a series of years. In making our deductions from Table I, the Velvet Chaff,* or standard variety, is placed after the one or two varieties which are to be compared with it.

*Penquite's Velvet.

WHEAT—TABLE I—COMPARATIVE YIELD OF VARIETIES PER ACRE.

Variety.	Yield and weight per bushel at Wooster.						4-year average at Columbus. 1888-1891.
	Yield of grain.					Weight per bushel.	
	1893.	1894.	1895.	1896.	4-year average.		
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Lbs.*	*Bus.*
Mediterranean	31.25	15.20	13.29	12.66	18.10	58.0	32.24
Lehigh	29.16	10.00	8.91	10.33	14.61	58.0	.....
Velvet Chaff	31.33	15.60	13.45	12.00	18.09	59.0	.....
Hindostan	30.66	8.80	8.08	7.50	13.76	58.0	.....
Velvet Chaff	27.33	12.40	13.91	12.45	16.52	.....	.....
Sibley's New Golden	31.00	11 50	9.50	10.25	15.56	.....	30.44
Velvet Chaff	30.00	14.00	11.91	11.35	16 81	.....	.....
Democrat	34.83	15.00	9.33	9.00	17.04	57.5	34.84
Deitz	34.50	16.90	8.87	8.33	17.15	58.6	32.97
Velvet Chaff	30.91	13 00	10.91	9.20	16.00	.....	.....
Lebanon	33.83	14.20	8 50	9.33	16.46	.....	.....
Valley	33.33	13.40	11.75	8.75	16.80	58.5	38.12
Velvet Chaff	29.41	14 40	11.66	9.62	16.27	.....	.....
Egyptian	33.41	14.70	12 25	10.62	16.74	58.3	37.17
Rudy	34.91	13.70	7.04	10.75	16.60	58.3	.....
Velvet Chaff	27.25	15 40	11.37	8.41	15.61	.....	.....
Red Fultz	32.58	21 70	12.16	13.90	20.08	58.6	32.32
Poole	35.00	29.20	11 00	12.58	19.44	58.2	34.56
Velvet Chaff	27.25	19.30	10.91	10.12	16.89	.....	.....
Nigger	33 91	29 20	8.04	9.27	20.10	59.0	33.50
Velvet Chaff	29.75	20.40	9.96	9.20	17.32	.....	.....
Geneva	32.25	28.40	13.08	10.00	20.93	61.0	.....
Tuscan Island	32.91	22.50	9.91	12.54	19.46	59.3	35.14
Velvet Chaff	29.33	21.60	13.66	10 25	18.71	.....	.....
Mealy	30.58	33.10	16.54	11.75	22.99	57.2	33.53
Velvet Chaff	29.16	21 60	13.66	10.25	18.67	.....	.....
Fultz	21.91	24.10	12 71	6.17	16.22	58.7	.....
Velvet Chaff	26.66	22.00	14.04	12.00	18.67	.....	.....
Wisconsin Triumph	23.08	23.60	12.21	8.00	16.72	59.0	.....
Velvet Chaff	25.70	22.00	13.46	10.66	17.75	.....	.....
Fulcaster	27.00	14.50	9.41	9.16	15.01	59.5	.....
Velvet Chaff	25.64	17.20	11.54	11.75	16.53	.....	.....
New Longberry	25.75	10.00	10.25	10.10	14.00	57.6	.....
Velvet Chaff	25.64	22.10	12.50	10.50	17.68	.....	.....
Currell's Prolific	30.25	16.20	10.54	11.12	16.87	58.6	.....
Velvet Chaff	25 64	18.50	12.50	10.50	16.78	.....	.....
Silver Chaff	26.66	14.20	10.54	8.83	15.05	57.4	30.74
Velvet Chaff	26.41	17.80	12.04	10.16	16.60	.....	.....
Martin's Amber	29.41	13.80	12.08	8.66	15.98	59.1	32.72
Velvet Chaff	26.41	17.80	11.54	11.75	16.87	.....	.....
New Monarch	30.41	22.20	14.16	11.33	19.52	58.5	.....
Velvet Chaff	24.08	22.10	13.45	10.16	17.45	.....	.....
Royal Australian	25.50	9.90	11.29	9.08	13.94	57.4	32.58
Velvet Chaff	25.75	17.20	10.76	12.29	16.50	.....	.....
Theiss	21.41	15.22	9 37	7.33	13.33	60.0	29.26
Velvet Chaff	25.75	15.50	10.76	12.29	16.07	.....	.....
Early White Leader	20.16	18.80	13.12	6.00	14 52	56.8	.....
Velvet Chaff	20.75	17.80	10.37	8.20	14.28	.....	.....
Gypsy	27.50	18.50	14.62	12.08	18.17	60.0	.....
Velvet Chaff	25.50	16.50	10.76	12.29	16.26	.....	.....
Early Ripe	31.51	19.70	10.00	14.00	17.87	59.2	.....

WHEAT—TABLE I—COMPARATIVE YIELD OF VARIETIES PER ACRE.

Variety.	Yield and weight per bushel at Wooster.						4 year average at Columbus. 1888-1891.
	Yield of grain.					Weight per bushel.	
	1893.	1994.	1895.	1896.	4-year average.		
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Bus.*	*Lbs.*	*Bus.*
Velvet Chaff	26.41	18.50	11.41	10 66	16.74	.....	.....
Missouri Blue Stem	27.47	14.60	7.58	7.29	14 23	59.3	33.22
Velvet Chaff	25.00	18.50	10.76	11.50	16.44	.....	.....
Bearded Monarch	23.91	22.20	8.20	9.62	15.98	.....	33.55
Velvet Chaff	25.00	17.20	10.76	11.50	16 11	.....	.....
Yellow Gypsy	20.83	18.20	7.96	6.00	13.23	58.0	.....
Velvet Chaff	23.75	18.40	8.79	10.66	15.40	.....	.....
Early Red Clawson	25.33	14.00	8.37	7.95	14.16	57.3	.....
Velvet Chaff	23.75	18.40	8.79	10.33	15.32	.....	.....
Hickman	19.41	19.80	9.25	7.75	14.05	59.4	34.65
Velvet Chaff	22.25	17.30	9.37	10.29	14.80	.....	.....
Jones' Winter Fife	20.75	15.80	11.08	7.25	13.96	57.6	.....
Velvet Chaff	25.50	18.40	10.62	10.91	16.35	.....	.....
American Bronze	20.50	19.20	11.45	7.50	14.66	58.1	.....
Velvet Chaff	20.87	17.00	8 54	7.50	13.48	.....	.....
Jones' Square Head	20.54	17.80	10.62	10.91	14.97	56.5	.....
Velvet Chaff							

Comparing results in Table I, in the manner indicated above, we find the following named varieties have given an average product of more than two bushels per acre in excess of the average of the nearest Velvet Chaff plot: Red Fultz, Poole, Nigger, Geneva, Mealy and New Monarch. Of the above the Red Fultz has averaged 3.19 bushels more per acre than Velvet Chaff, and Mealy 4.32 bushels more, the other varieties named giving less than three bushels more.

The following named sorts have given yields from one to two bushels more per acre than the standard sort: Democrat, Deitz, Egyptian, Rudy, Gypsy, Early Ripe and American Bronze.

The following have given an average yield of from one half to one bushel more than the Velvet Chaff: Valley and Tuscan Island.

Of those yielding three bushels less than the Velvet Chaff we have Lehigh and New Longberry; of those yielding from two to three bushels less, may be named the following: Hindostan, Royal Australian, Fultz, Theiss, Missouri Blue Stem, Yellow Gypsy and Jones' Winter Fife.

The following have given an average yield for the four years of from 1 to 2 bushels less per acre than the sort used as a standard: Sibley's New Golden, Wisconsin Triumph, Fulcaster, Silver Chaff (smooth) and Early Red Clawson.

The following have given an average yield of less than one bushel per acre below the standard: Martin's Amber and Hickman. The other sorts have given an average yield so nearly that of the nearest Velvet Chaff plot that they are considered as giving equivalent yields.

In the sixth column of this table is given the average weight per measured bushel of thirty-six of the forty varieties included. One of these (Geneva) has averaged one pound per bushel above the standard and two others (Theiss and Gypsy) have averaged standard weight of sixty pounds. The other thirty-seven varieties have averaged from less than one pound to three and a half pounds under legal standard. This is doubtless due in part to conditions to which I shall have occasion to refer further on.

Eighteen of the forty varieties in Table I were grown four years consecutively in our comparative tests at Columbus, and the average yields of these for the four years are given in the last column of the table. These figures are interesting, in that they show that the four years' average yield was in nine varieties out of the eighteen more than twice as high as the average of the same varieties on the Wayne county soil. This difference does not show that the land on the University farm at Columbus is so much better wheat land than the Wayne county land, but simply indicates that the last four years were not as good wheat years as the four preceeding.

Considering the four years, 1893 to 1896 inclusive, the following inferences and explanations should be noted: Namely, that from yields of 1893, as shown by the table, it is fair to regard it as a normal or average season. The Station crop of 1894 fell below the general average on neighboring farms, as a result of seed treatment in connection with soil condition immediately after seeding. As indicated on a preceding page, we are adding every year some new varieties of wheat and by this process we are almost certain to introduce smut, if it exists in other sections of the country, and with so many varieties, some of which we believe are more susceptible to the disease than others, if it is in our vicinity we are all the more likely to have trouble from its presence. This was the condition which confronted us in the variety work in the fall of 1893. The disease was noticed in only a few varieties as early as 1888, but each year other varieties were affected until we had few if any that were entirely free from it. This was true not only in our variety experiments, but had extended into all the wheat, including general field work, and in this to such an extent that it was feared it would injure the quality of the flour. The time was ripe for heroic treatment and it was decided that every grain of wheat sown upon the farm that fall should be treated before it went into the ground. The specific treatment given and the more particular results will be given under another heading, it is sufficient to say here that the yield was cut down and perhaps the quality of the grain was in a measure injured.

The crop of 1895 was seriously injured by winter freezing and late or untimely frosts. The crop of 1896 had to contend with an exceptionally dry fall; a large share of the wheat on the farm was drilled in dust and a part of it in ground so dry that it was simply impossible to make

it compact. Some of it lay in the ground until after the middle of October before it had sufficient moisture to start it.

The wheat went into winter in such a weak condition that nothing but a short crop could be expected for the harvest.

Table II includes twenty-five of the newer varieties of wheat, fourteen of which were grown in the comparative test of 1893. As in the preceding table, the yield of the nearest plot of the standard variety is entered just after the one with which it is fair to compare it. Among these fourteen it will be fair to make comparisons, but it will not be just to compare the first fourteen with those grown in a different year, for the reason (which the most casual observer will notice) that the yields are much lower for 1895 than for 1893, and the quality of the wheat in 1893 was also much better than in 1895. Only one variety fell below standard weight in 1893 while all but two of the fourteen run from one to three pounds above. In 1895 not one of the eight varieties reached standard weight, but all fell from one to four and one-half pounds below.

This table also includes the date of ripening of the several varieties and the color of the grain, and notes whether they belong to the smooth or bearded classes.

During the fall of 1895 considerable was said, at least locally, about "Red Beauty" wheat. It was in such high favor that some farmers were induced to take contracts to deliver half the crop at the mills to the credit of parties who furnished seed and one hundred and fifty pounds of fertilizer to each acre sown. An effort was made to secure enough seed to sow a tenth acre in the comparative test at the Station, but all to no purpose. The next year, however, the seed could be had merely for the asking, and after two years' growing and making comparisons, it proves to be nothing more than Red Clawson under a new name. The wheat referred to is No. 16 in Table II.

WHEAT—TABLE II.—COMPARATIVE YIELD OF SOME OF THE NEWER VARIETIES.

Variety.	Yield per acre.	Weight per bushel.	Date of ripening.	Color of grain.	Bearded or smooth.
	Bushels.	*Pounds.*			
1. Beal	20.41	60.0	July 13	Red	Bearded.
Velvet Chaff	20.75	63.0	" 8	"	"
2. Bailey	17.75	60 0	" 13	"	"
Velvet Chaff	20.54	63 0	" 8	"	"
3. Roberts	23.16	62.0	" 11	"	"
Velvet Chaff	20.75	63.0	" 8	"	"
4. Willits	22.33	58.5	" 13	"	Smooth.
Velvet Chaff	20.54	63.0	" 8	"	Bearded.
5. Badger	24.91	62.5	" 9	"	Smooth.
Velvet Chaff	22.50	63.0	" 8	"	Bearded.
6. New Michigan Amber	24.91	61.5	" 11	"	Smooth.
Velvet Chaff	22.50	63.0	" 8	"	Bearded.
7. Buckeye	20.75	61.2	" 11	"	"
Velvet Chaff	22.25	63.0	" 8	"	"
8. Ruehlen	21.60	62.2	" 13	White	"
Velvet Chaff	22.16	63.0	" 8	Red	"
9. Crate	24.91	62.0	" 10	"	Smootn.
Velvet Chaff	21.55	63.0	" 8	"	Bearded.
10. Johnson	19.08	61.0	" 13	"	"
Velvet Chaff	20.75	63.0	" 8	"	"
11. Pickaway	21.25	62.5	" 11	"	"
Velvet Chaff	21.41	63.0	" 8	"	"
12. Post	23.25	62.5	" 11	"	"
Velvet Chaff	20.75	63.0	" 8	"	"
13. Fairfield	23.91	61.0	" 11	"	"
Velvet Chaff	23.75	63.0	" 8	"	"
14. Fultz Blue Stem	19.25	61.5	" 11	"	"
Velvet Chaff	23.75	63.0	" 8	"	"
1894.					
15. World's Fair	30.70	62.2	" 7	"	Smooth.
Velvet Chaff	22.00	60.7	" 7	"	Bearded.
1895.					
16. Red Beauty	12.75	59.0	" 6	"	Smooth.
Velvet Chaff	10.58	59.0	" 5	"	Bearded.
17. Improved Poole	11.62	57.0	" 12	"	Smooth.
Velvet Chaff	10.58	59.0	" 5	"	Bearded.
18. Kentucky Giant	8.16	55.5	" 12	"	"
Velvet Chaff	9.96	59.0	" 5	"	"
19. Green	14.16	57.0	" 5	White	Smooth
Velvet Chaff	11.79	59.0	" 5	Red	Bearded.
20. Perfection	11.58	59.0	" 5	"	Smooth.
Velvet Chaff	11.79	59.0	" 5	"	Bearded.
21. Smith's Rust Proof	12.79	59.0	" 5	White	Smooth.
Velvet Chaff	12.37	59.0	" 5	Red	Bearded.
22. New Columbia	12.96	59.0	" 6	"	Smooth.
Velvet Chaff	11.41	59.0	" 5	"	Bearded.
23. Gold Coin	12.79	58.5	" 5	"	Smooth.
Velvet Chaff	11.79	59.0	" 5	"	Bearded.
24. Rochester Red	11.78	.....	" 8	"	Smooth.
Velvet Chaff	11.41	59.0	" 5	"	Bearded.

WHEAT—TABLE II.—Concluded.

Variety.	Yield per acre.	Weight per bushel.	Date of ripening.	Color of grain.	Bearded or smooth.
	Bushels.	*Pounds.*			
25. Hard Wheat (Minnesota)...	7.91	56.0	July 10	Red.....	Bearded.
Velvet Chaff.....	9.37	59.0	" 5	"	"
1896.					
26. Reliable Minnesota	6.00	56.0	" 4	"	"
Velvet Chaff.....	7.50	58.0	" 4	"	"

Other so called varieties in Table II are only newly named old sorts, specific mention of which will be made under the head of synonyms. Most of the sorts in this table have been included for but one or two years in the comparative tests, and for this reason conclusions as to their adaptability to Ohio soils will be deferred.

Table III gives a comprehensive view of the yields of fifteen varieties of wheat for five years, and the five-year average of each. Eight of these varieties have been dropped out of our list for the reasons which follow: Namely, Witter, Russian Red, Miller's Prolific, and Sheriff on account of their average yield falling to or below thirty bushels per acre; Diehl Mediterranean, Tasmanian Red and German Emperor, because they are duplicates of others bearing different names; Ontario Wonder, because it was thought to be especially susceptible to smut. The other seven varieties are standard sorts and are inserted in the same table for the sake of convenience in making comparisons between standard sorts and those sorts that have been dropped out.

WHEAT—TABLE III.—COMPARATIVE YIELD OF FIFTEEN VARIETIES FOR FIVE YEARS.

Bushels Per Acre.

Variety.	1888.	1889.	1890.	1891.	1892.	Av'ge.
Witter	26.80	34.30	24.16	36.66	30.00	30.18
Diehl-Mediterranean	34.10	42.00	27.50	37.66	29.66	34.18
Sheriff	25.00	35.60	27.91	33.83	24.25	29.31
Tasmanian Red	25.00	37.10	29.30	33.10	29.60	30.82
Ontario Wonder	25.60	52.00	25.08	29.00	23.58	31.05
German Emperor	40.00	30.40	30.06	32.33	27.75	32.10
Russian Red	19.10	45.10	19.41	37.33	27.08	29.60
Oregon	24.40	48 80	26.62	32.00	27.00	31.76
Miller's Prolific	16.00	36.10	23.00	33.00	20.16	25.65
Reliable	28 60	49.10	36.16	39.14	32.58	37.09
Poole	17.50	43.60	29.66	35.91	30.08	31.35
Democrat	25.00	45 30	30.41	38.16	29.50	33.67
Nigger	32.00	40.60	31.75	31.66	30.00	33.20
Hicks	27.60	45.70	34.66	33.66	24.58	33.24
Wyandot Red	29.90	34.50	34.66	32.00	28.75	31.96

WHEAT.—TABLE IV—COMPARATIVE YIELD OF VARIETIES FOR TEN YEARS.

Bushels per acre.

Variety.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	Average.
Valley	34.9	33.6	44.5	36.1	39.5	32.2	33.3	13.4	11.8	8.8	28.8
Red Fultz	35.2	30.9	37.3	32.5	32.4	27.0	32.6	21.7	12.1	13.9	27.6
Egyptian	28.0	32.2	46.1	34.0	37.2	31.3	33.4	14.7	12.2	10.6	28.0
Nigger	24.6	32.0	40.6	31.7	31.6	30 0	33.9	29.2	8.0	9.2	27.0
Royal Australian	38.8	18.1	45.6	32.6	24.5	27.5	25.5	9 9	11.2	9.0	24.0
Poole	25.5	17.5	43.6	29.6	35.9	30.0	35.0	29.2	11.0	12.6	27.0
Velvet Chaff	37.4	26.6	41.3	35.2	27.9	25.4	28.1	17.8	11.4	9.8	26.0
Silver Chaff	30.0	31.4	37.8	29.5	30.1	25.4	26.7	14.2	10.5	8.8	24.4
Democrat	24.5	25.0	45.3	30.4	38.1	29.5	34.8	15.0	9.3	9.0	26.0
Martin's Amber	21.4	28.2	47.8	29.1	28.8	25.1	29.4	13.8	12.0	8.7	24.4
Fultz	.....	23.1	30.1	34.2	35.6	30.4	21.9	24.1	12.7	6.1	24.2
Theiss	29.5	36.8	37.8	25.4	30.5	23.3	21.4	15.2	9.3	7.3	24.0
Mediterranean	22.3	28.2	36.8	29.3	34.5	28.3	31.2	15.2	13.2	12.6	25.1
Mean	29.3	28.0	41.1	31.5	32.8	28.0	29.8	17.9	11.7	9.6	25.9

Table IV gives the yearly and average yield of thirteen differently named sorts which have been grown for ten years consecutively. This places these several varieties upon an equal footing, since the conditions under which they were grown during the ten years were as nearly alike as possible. This table shows some interesting figures in wheat growing, marking the two seasons of 1895 and 1896 as years giving light and inferior crops. Leaving out of consideration the season of 1894, in which the low yield is explained elsewhere, it is found that the mean yield of these thirteen varieties has not fallen in one season in seven below 28 bushels per acre. Including the season of 1894 and the two disastrous seasons of 1895 and 1896, we find a mean average yield of almost twenty-six bushels per acre, or about double the average yield per acre for the United States. This table also brings out quite clearly those varieties which have done best in a series of comparative tests. It gives evidence of higher returns from Valley wheat than from any other. It should not be forgotten, however, in this connection, that six out of ten of these tests were made on bottom or second bottom land at Columbus, and the reader is referred to Table I, from which he will find that while the Valley wheat has done so well on the kind of land referred to, a number of other varieties have done decidedly better on the clay lands near Wooster: among these may be mentioned Mealy, Poole and its synonym, Red Fultz, Nigger, Geneva, Mediterranean, Democrat, Deitz and New Monarch. Other sorts have done quite as well as the Valley on this soil, and as indicated in circulars sent out from year to year, the Valley is recommended for the more gravelly soils and not for those containing a high proportion of clay.

It will be noted that no account is given of straw in any of the tables in this bulletin. It has been purposely omitted on account of irregularities in three years out of the four. These irregularities were not due to any lack of care in weighing and keeping records, but to excessive growth of timothy, and in some instances weeds, among the wheat. These reasons apply especially to the seasons of 1894 and 1895, and the extremely wet weather of the harvest of 1896 caused much uncertainty on account of wet straw.*

WHEAT FROM THE NORTHWEST.

It is a well known fact that millers generally claim that the wheats from the Northwest make a superior grade of flour. Many of them mix these harder wheats from the Northwest with home grown varieties, in order to give the flour a higher market value. With this information the Station has undertaken to grow the hard wheat, seed of which was brought from Manitoba in the fall of 1893. The results the first year were not favorable to the new wheat, although it had every advantage,

*It should be explained, that in our variety tests of cereals, corn, oats, wheat and timothy and clover are grown in a five year rotation, the wheat being top-dressed with barnyard manure. No other fertilizer is used during the rotation.

and was especially favored in not having been subjected to treatment for smut, as were all the home grown sorts, with the hope that it might do better after becoming acclimated. In has been continued in the comparative test four years. In the fall of 1895 a second variety was secured from Minnesota, called "Reliable Minnesota." This variety has been grown two seasons; the exact results for this year will not be known in time for publication in this bulletin, but from present appearances it will be a conservative opinion to say that neither of the varieties tried gives promise of doing as well as our native sorts. Each of these are given in Table II, from which some idea of their comparative value may be drawn.

SYNONYMS.

Of the sorts mentioned and considered in this bulletin, as well as a few not noticed, quite a number are the same varieties under different names. Of these I name the following that will not appear hereafter in our publications, unless for good reasons our conclusions be changed: Red Fultz, Michigan Amber, German Emperor and Improved Poole are believed to be the same as Poole. Hybrid Mediterranean, Golden Cross, Raub's Black Prolific, Missouri Blue Stem, Brady Lake, Seneca Chief, Michigan Bronze, Andrew's No. 4, Sibley's Hybrid, American Bronze and Yuba the same as Diehl Mediterranean; Martin's Amber and Landreth, the same as Silver Chaff (smooth); Tasmanian Red and Sibley's New Golden, the same as Clawson; Hickman the same as Hicks; Rocky Mountain, Finley and Rice the same as Fultz; Reliable Egyptian aud Miami Valley the same as Valley; Kentucky Giant the same as Nigger. There may be some minor differences in individual characteristics of the above but if so I have failed to detect them.

RED *vs.* WHITE AND SMOOTH *vs.* BEARDED WHEATS.

From Table V we find that in the last eight years' work in comparative testing, record has been kept of sixty-six trials of white wheats and 420 of red wheats. The average yield per acre from white wheats has been 23.3 bushels, while the greater number of red wheats has averaged exactly twenty-four bushels per acre for the series of eight years. Taking up the records for fifteen years, similar results are obtained. The total number of trials of white wheats recorded reaches 144 and the average yield per acre 27.30 bushels; the total number of red wheats recorded on trial aggregate 627, giving an average yield of 27.81 bushels per acre.

During the eight years indicated in the table 235 trials of bearded wheats are recorded, giving an average yield of 24.4 bushels per acre while the smooth wheats recorded number 247 with an average yield of 23.8 bushels per acre. Considering the bearded and smooth varieties as recorded for fifteen years, we have a total of 342 trials of the bearded sorts, averaging 25.95 bushels per acre, and 418 trials of smooth sorts, averaging 26.44 bushels per acre.

WHEAT—TABLE V—AVERAGE YIELDS FOR EIGHT YEARS OF WHITE, RED, BEARDED AND SMOOTH VARIETIES.

Bushels per acre.

Year.	White.		Red.		Bearded.		Smooth.		Means.
	No. of varieties.	Average yield.	No. of varieties.	Average yield.	No. of varieties.	Average yield.	No. of varieties.	Average yield.	
1889.....	6	37.0	61	38.0	31	40.5	36	37.4	38.2
1890.....	7	29.5	45	29.3	23	30.2	29	28.7	29.4
1891.....	7	33.0	44	32.7	24	33.6	27	31.9	35.3
1892.....	9	26.2	53	26.7	32	26.7	27	26.3	26.4
1893.....	11	26.9	65	27.2	36	28.4	39	25.7	27.0
1894.....	5	14.0	53	18.6	31	16.8	27	20.0	17.3
1895.....	10	11.7	50	10.7	29	9.8	31	11.8	11.0
1896.....	11	8.2	49	9.2	29	9.1	31	8.8	8.8
Totals and means...	66	23.3	420	24.0	235	24.4	247	23.8	23.8

These divisions of the two classes run so nearly parallel that the little margin of differences does not warrant the conclusion that the bearded varieties are superior to the smooth, nor that the red wheats produce more as a class than the white wheats, but it is true that there are good sorts in all these classes and there are poor ones in all. In short, the only conclusion that we can legitimately draw is that some bearded varieties are better producers than some of the smooth varieties and *vice versa*, and some of the red wheats give better yields than some of the white wheats and *vice versa*.

Of the several kinds of wheat considered in this bulletin, the following are white varieties: Democrat, Silver Chaff (smooth), Martin's Amber, Royal Australian, Early White Leader, Jones' Square Head, Ruehlen, Green, Smith's Rust Proof, White Golden Cross, Golden Prolific, Surprise, Miller's Prolific and Landreth. All others are red or amber in color.

The following are the smooth or bald wheats: Wyandot Red, Red Fultz, Michigan Amber, German Emperor, Poole, Witter, Miller's Prolific, Sheriff, Big English, Surprise, Mealy, Russian Red, Hick's, Fultz, Ontario Wonder, Currell's Prolific, Improved Rice, Extra Early Oakley, Silver Chaff, Martin's Amber, Landreth, Royal Australian, Oregon, Longberry, Crate, Wisconsin Triumph, Early Ripe, Rocky Mountain, New Monarch, Fultz Blue Stem, Early Red Clawson, Hickman, Jones, Winter Fife, American Bronze, Jones' Square Head, Willit's, New Michigan Amber, Badger, Post, Early White Leader, New Columbia, World's Fair, Rochester Red, Improved Poole, Canadian Hybrid, Red Beauty, Green, Perfection, Gold Coin and Smith's Rust Proof. All not named in this list are bearded sorts.

II. Cultural investigations.

Some of the work taken up under this heading is a duplication of that done at Columbus and which, for that soil, seemed to have determined pretty well the questions asked; but the land here being entirely different, this duplication has a phase of considerable interest. This division of the bulletin will consider the following topics: Thick and thin seeding; early and late seeding; methods of seeding; methods of soil preparation; deterioration of seed; seed treatment for smut.

Thick and thin seeding.

The results of a series of tests at Columbus with thick and thin seeding showed that from five to seven pecks of seed per acre, while not giving uniformly the highest yields, gave a higher average return than either lighter or heavier seeding. The test, as duplicated on this soil, has not given like returns, but on the contrary has given higher average yields as the amount of seed per acre has been increased up to ten pecks per acre; but when it is taken into consideration that in the three seasons last past abnormal conditions prevailed, the tables indicate just what we might reasonably expect. The season of 1894 gave low yields on account of injury to seed, and naturally the more planted the more there was toward making a full stand. The climatic conditions of 1895 and 1896 in like manner thinned out an uncertain quantity, leaving only the right to draw the inference that in unfavorable seasons larger quantities of seed used, up to eight or ten pecks per acre, give an increased yield at harvest. Table VII also shows that the more thickly the wheat stood on the ground the higher the weight per measured bushel, and consequently the better the quality of the berry. These results, without considering conditions, are contradictory to the results obtained from all our past tests along this line, but including conditions the results are not inharmonious. In this division of the work the straw weights are not included for the same reason that they were omitted elsewhere.

Early and late seeding.

After seven years' trial on the Ohio State University farm we found that, with a single slight exception, the highest yields had been produced from seeding during the last week in September and the first week in October. Some difference of latitude and considerable difference in character of soil make a duplication of that work of interest here. A single experiment in different dates of seeding is shown in Table VIII, and for that season points quite conclusively to the advisability of seeding during the first three weeks of September. This experiment will be continued for a series of years if possible, meanwhile the opinion will be only tentative that early September seeding is best.

WHEAT—TABLE VII—THICK AND THIN SEEDING.

Rate of seeding per acre	Yield per acre.				Weight per bushel.			
	1894.	1895.	1896.	Average.	1894.	1895.	1896.	Average.
	Valley wheat.							
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
3 pecks	5.00	6.20	6 49	5.89	57	56	59	57.3
4 "	6.20	6.87	7.95	7.00	58	57	60	58.3
5 "	8.30	7.29	8.83	8.14	58	57	61	58.6
6 "	6.80	6.78	7.33	6.97	58	57	60	58.3
7 "	8.20	8.04	8.00	8.08	58	57	61	58.6
8 "	10.85	9.49	8.66	9.66	59	57	61	59.0
9 "	10.50	.....	.....	.....	59	57	61	59.0
10 "	12.50	8.33	.....	10.41	59	57	60	58.6
	Rudy wheat.							
3 pecks	.....	2.33	6.33	4.33	.....	56.0	53.2	54.6
4 "	.....	3.33	6.49	4.91	.....	55 5	53.3	54.4
5 "	.....	3.74	5.03	4.38	.....	57.8	54.2	56.0
6 "	.....	5.12	7.25	6.18	.....	57.0	55.2	56.1
7 "	.....	5.50	8.83	7.16	.....	56.7	55.8	56.2
8 "	.....	5.12	10.16	7.64	.....	57.2	55.3	56.2
9 "	.....	.....	10.33	.....	.....	58.0	56.0	57.0
10 "	.....	5.25	10.66	7.95	.....	58.0	56.0	57.0

METHODS OF SEEDING.

Tables IX and X give results from different methods of seeding, including depths of drilling; seeding by drill; sowing broadcast and covering with harrow; harrowing wheat in spring; rolling the ground just before and just after seeding; mulching as a winter protection, and seeding the ground by drilling the land one way or drilling both ways. From the average of the first four plots in Table IX there seems to be no practical difference from depth of planting, except that the three inch seeding gives a higher average product than any other depth tried; and the average from the plot sowed broadcast shows as good returns as those drilled in one, two or four inches deep. Light mulching may have been some help, but heavier mulching, as noted in previous bulletins, is a failure. While there is no marked indication that spring harrowing has been a benefit, there is on the other hand no evidence of its having done any injury, and the rolling after drilling may have been helpful.

Plots 11, 12 and 16, while not confirmed by a second trial, indicate that compacting the soil may be beneficial, and the single trial of harrowing the ground after drilling the seed gives evidence of having done good. Plot 15, in this table, was put in by shutting off alternate feeds of the

drill. The after cultivation was similar to that of working corn. Plot 14 was harrowed at least three times over more than any other plot, but the result does not show that the extra harrowing was any advantage to the crop. By way of explanation, it should be said that plots 6, 9 and 17 were drilled after giving the ground such preparation as we give for the ordinary field crop.

WHEAT—TABLE VIII—EARLY AND LATE SEEDING—1895.

Plot number	15	16	17	18	19	20	21	22
Date of seeding	Sep. 8	Sep.15	Sep.22	Sep.29	Oct. 6	Oct.13	Oct.20	Oct.27
Yield of grain per acre, bus.	8.50	7.58	8.03	4.97	5 75	5.75	5.03	2.30
Yield of straw per acre, lbs.	940	945	915	975	705	655	580	570
Weight of bushel, lbs.	57.5	56.5	57.0	57.0	57.0	57.0	56.0	56.0

WHEAT—TABLE IX—METHODS OF CULTURE.

Plot No.	Method of culture.	Yield per acre.			
		1893.	1895.	1896.	Average.
		Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1	Drilled 1 inch deep	18.00	6.58	3.45	9.34
2	" 2 " "	18.16	4.16	5.50	9.27
3	" 3 " "	21.30	3.50	6.08	10.29
4	" 4 " "	18.08	4.00	5.58	9.22
5	Broadcast	17.08	4.00	6.75	9.27
6	Ordinary drilling (1 to 2 inches)	20.49	4.83	6.41	10.57
7	Light mulch	17.25	4.00	8.33	9.86
8	Heavy "	15.66	4.00	5.66	8.44
9	Ordinary	18.27	4.08	5.55	9.30
10	Spring harrowed	20.76	4.00	5.33	10.03
11	Rolled after drilling	23.83	3.66	5.33	10.94
12	" before "	22.00	4.91		
13	Harrowed after drilling	23.25			
14	" before "	18.66			
15	Cultivated	16.33			
16	Drilled with roller attachment	20.22			
17	Ordinary	19.72			

Table X deals with the question of producing more or less grain by drilling the seed both ways and thus doubling the work of seeding. Three methods were employed: First, drilling equal quantities each way, second, drilling three pecks one way and five pecks the other, and third, drilling six pecks one way. The first and last show practically equivalent returns, while cross drilling with more seed one way than the other has decreased the yield. The first and second methods have increased the work without giving corresponding returns at the thresher.

METHODS OF SOIL PREPARATION.

It has been our custom to top-dress a portion of our wheat ground with yard manure each fall before seeding. Personally I have advocated plowing the ground for wheat as early after harvest as possible and rolling it at once, then applying as soon as possible the top dressing and immediately harrowing it in so as to incorporate the manure with the soil as quickly as possible. I had advocated this method from mere observation and not from the results of actual tests. Director Thorne suggested that a trial be made by applying manure as early as convenient to a series of plots, and to another series just before seeding. The experiment was carried out with results as shown in Table XI. The single experiment indicates that the early manuring is very decidedly better than the later; however, I do not assume to say that the difference would be so decided or even approximately as wide in every instance.*

A similar experiment was undertaken with corn in the spring of 1894: The results in the corn crop were contradictory. The report of the effect on the oats may be found in Bulletin No. 67, page 15. Summarized it shows about three bushels more oats per acre from land manured in February for corn than from the same area manured two months later. The same plots drilled to wheat following the oats show a slight decrease in the yield of wheat, where we had the increase in oats; namely, from the earlier manuring for corn. Other details of the test are given in Plots 9 to 13 in Table XI.

WHEAT—TABLE X—CROSS DRILLING.

Method of seeding.	Yield per acre.		Weight per bushel.
	Grain.	Straw.	
	Bushels.	*Pounds.*	*Pounds.*
Three pecks drilled each way	27.75	2,200	61 5
Three pecks one way and five across	25.00	2,170	61 0
Six pecks drilled one way	28.25	2,260	62.0

*The results are as expected by the Director. The object in making the test is to get an actual comparison of the two methods.

WHEAT—TABLE XI—EARLY VS. LATE MANURING—EFFECT OF PREVIOUS CROPPING.

Plot No.	Treatment.	Yield per acre.		Weight per bushel.	Plot No.	Treatment.	Yield per acre.	
		Grain.	Straw.				Grain.	Straw.
		Bushels.	*Pounds.*	*Pounds*			*Bushels.*	*Pounds.*
1	Manured August 20	14.58	1,265	58.7	9	Manured for corn February 12	7.75	772
2	" September 26	6.83	690	58.0	10	" " April 15	9.00	1,100
3	" August 20	13.58	935	59.5	11	Not manured	75	515
4	" September 26	10.66	910	59.5	12	Manured for corn February 12	04	767
5	" August 20	11.83	840	59.5	13	" " April 15	9.08	990
6	" September 26	9.50	840	59.0				
7	" August 20	11.08	885	59.0	14	After rape	10.70	1,417
8	" September 26	10.16	590	59.0	15	" Canada peas and oats	16.33	1,900
	Average early manured	12.76	981		16	" Canada peas	15.00	1,670
	Average late manured	9.28	735		17	" Canada peas	14.00	1,670

Plots 14 to 17 inclusive give results of wheat after certain forage crops had been grown on the land. It has been thought that the rape plant was hard on ground, and the photograph in Bulletin No. 70 of this Station (Plate IV) indicates that there may be some reason for the suspicion; the results as shown in Table XI are a further proof of the correctness of the opinion. Regarding the plots 15, 16 and 17, it should be noted that the Canada peas, and the Canada peas and oats, made a complete and dense covering of the ground, while the cow peas did not even cover the ground, and did not show, at any part of the season, a thrift corresponding to that of the Canada peas.

Under this same heading results from previous treatment of the soil may be properly considered. In Bulletin No. 67, page 15, may be found a detailed record of oats yield after disking and after plowing as a means of preparation of the seed bed. These same plots were plowed to a uniform depth for wheat the following fall, drilled to one variety of wheat and at the same rate per acre. The difference in plowing between those that had been disked and those plowed the previous spring was very marked. A rain just before plowing showed plainly that while the disked plots were wet on an average five inches deep, the same rain extended full seven inches into the ground that had been plowed preparatory to seeding oats. Table XII gives the yields of wheat on these plots, following the oats.

WHEAT—TABLE XII—EFFECT OF DISKING OR PLOWING FOR PREVIOUS OAT CROP.

Plot. No.	Treatment for oats.	Yield of wheat per acre.			
		1895.		1896.	
		Grain.	Straw.	Grain.	Straw.
		Bushels.	*Pounds.*	*Bushels.*	*Pounds.*
1	Disked	8.33	990	6.25	522
2	Plowed	8.33	930	6.35	375
3	Disked	6.66	630	8.83	570
4	Plowed	5.83	640	9.41	585
5	Disked	5.00	540	9.54	677
6	Plowed	5.32	520	.....	.....
7	Disked	5.32	620	.....	.....
8	Plowed	5.16	610	.....	.....
.....	Average, disked	6.33	.....	8.22	.....
.....	Average plowed	6.16	.....	7.83	.....

WHEAT.—TABLE XIII—YIELDS FROM DIFFERENT GRADES OF SEED.

Variety.	Grade.	1893.	1894.	1895.	1896.	Average
		Yield per acre.				
		Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Velvet chaff	First	24.33	13.00	8.00	7.50	13.21
"	Second	23.16	16.20	5.75	9.08	13.29
"	Unscreen'd	24.37	18.20	4.66	4.75	12.99
Deitz	First	25.70	17.90	5.50	11.37	15.11
"	Second	23.74	19.00	5.83	10.33	14.72
"	Unscreen'd	22.66	19.30	5.08	7.83	13.71
Hicks	First	23.74	18 70	5.33	7.00	13.69
"	Second	23.79	16.90	4.33	7.83	13.21
"	Unscreen'd	25.45	17.30	4.25	6.75	13.43
		Weight per bushel.				
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Velvet chaff	First		61.2	56.5	49.7	55.8
"	Second		61.2	56.0	48.5	55.2
"	Unscreen'd		61.5	57.0	49 0	55.8
Deitz	First		61.0	57.0	54.0	57.3
"	Second		60.5	58.5	50 5	56.5
"	Unscreen'd		60.0	58.5	50.5	56.3
Hicks	First		60.0	58.0	52.5	56.8
"	Second		61.0	58.0	52.0	57.0
"	Unscreen'd		60.0	56.0	52.0	56.0

DETERIORATION OF SEED.

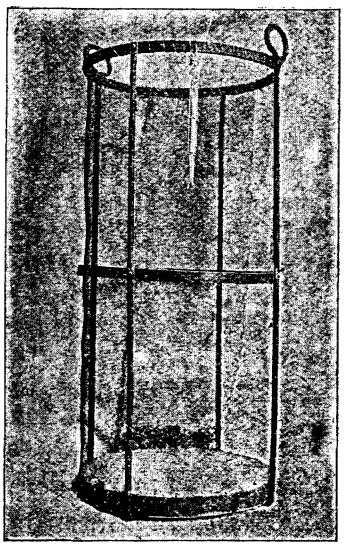
In the fall of 1891 a series of experiments was begun with a view to gain some light upon the vexed question of wheat "running out." Selected seed of three varieties was taken and from the product of that selected seed the best has been taken each year with the purpose if possible of breeding up. A second grade has been carried the same way from year to year, except that it has been screened, while a third class or grade has been used each year without screening, just as it came from the thresher, for the purpose of breeding down. The result of each year's work is given in Table XIV, showing yield in bushels, weight per measured bushel, and the average results for a period of four years. The figures show very slight differences in quantity and practically no difference in quality of product. The first season's work showed some marked differences (Bulletin 42, page 88) but the last four years' work does not confirm the results of the first. Were it not for the fact that the last three years have given abnormal results, on account of seed treatment and climatic conditions, I should conclude that I was working on a very pretty theory that would not work out in practice; but owing to the irregularities referred to it seems that it will be only fair to give the experiment further trial.

SEED TREATMENT FOR SMUT.

As stated elsewhere, all seed used in the fall of 1893 (except a few varieties introduced and one old variety overlooked) was treated for the prevention of smut. The conditions were such that heroic treatment seemed the only possible way out of the trouble. Up to this date the treatment with copper sulphate was best known and generally adopted where any method was used. The strength of solution best to use was not well defined, and since a solution bearing four ounces of copper sulphate to each gallon of water had seemed to destroy the smut germ as effectually as a solution bearing a pound to the gallon, it was arbitrarily decided to use four pounds of the copper sulphate to ten gallons of water. A gunny sack and two tubs of the solution were prepared and each variety in turn was put into the sack, immersed in the solution ten minutes, then two sticks were laid across the top of the tub and the sack was laid upon them to drain. After draining about five minutes they were emptied onto the barn floor and dusted with lime, after which the grain was frequently stirred and finally run through the fanning mill for the purpose of removing the lime. This put it into very fair shape for drilling, but not in as good condition as before it was treated. This treatment, as indicated on a previous page, resulted in the reduction of vitality of the seed, and this, in connection with soil and climatic conditions proved a serious draw back to the succeeding crop, but gave us wheat absolutely free from smut, not only free for that year, but up to this time I have been unable to find only a few smutted heads. I am of the opinion that the same treatment, modified by immersing the seed in clean water immediately after removing from the solution, would have given equally as good results so far as destroying the smut was concerned and would have given a better stand of wheat. Other suggestions regarding the treatment of seed may be had by referring to Bulletin No. 4 (Vol. VI). On page 87 of that bulletin will be found the experience of Mr. O. A. Cary, of Frankfort, Ohio, in which is given a more simple method than immersing the seed. It should be especially noted that he has increased the amount of seed considerably above the amount ordinarily used and with the treatment given I think it a very judicious thing to do.

Numerous experiments have been made at this Station by Mr. Selby and myself, and with the experience I have had, I regard the hot water treatment as efficient as any other and certainly the most simple and practical method thus far devised. For our use at the Station I have arranged an ordinary barrel, into which we have run a steam pipe connected with the boiler at the dairy house. We fill this barrel about half full of water, then turn on steam by a stop cock on the pipe, about the height of the barrel, (the pipe extending to within a foot of the bottom) and hold a Fahrenheit thermometer in the water until it marks 134°. It is best to use an ordinary dairy thermometer, and with a little care

it can remain in the water nearly all the time, as it will float, and the temperature of the water can be noted at any time much more quickly than if it is removed after each reading. The temperature, by this method, can be maintained very uniform and with surprisingly little trouble. We attempt to keep it at about 134°. We have done away entirely with the sack for immersing, and are using instead a basket made of rod iron and fly screen wire. This can be made by any handy blacksmith at expense not exceeding $1.25. The basket is represented in figure 1, and is made by taking two pieces of five-eighth inch rod iron, one piece eight feet long, the other six and one-half feet long, two pieces of flat iron bar, one-fourth inch by three-fourth inch, and two circular pieces of wood, cut out of two inch plank; one of these should be thirteen inches in diameter, the other twelve inches. In addition to the above there will be needed about five feet of 32-inch screen wire and thirty feet of light annealed wire.



Dipping Basket.

Take the longer iron rod, flatten by heating and hammering six and one-half inches on each side of the center or middle, turn each half at right angles six and one-half inches from the middle; sixteen inches from this angle flatten each side and make a hole for small rivet; flatten and make a second hole fifteen inches higher up, and one inch above the last hole of either side turn the balance of the rod into a handle. The shorter rod is to be treated the same as above except that there will be no handles to make. Take the two pieces of flat iron and make them into circles or hoops, about thirteen inches in diameter, making four holes in each, equally distant apart. This done it is ready to set up. To do this, take the longer and shorter rods, which have been flattened in the center, set the longer one with flattened part on the floor and the shorter one set on it at right angles, cut enough out of the center of one to allow the other to pass through, then make holes through each so that screws can be used to secure them to the round wooden bottom; rivet the two hoops to the rods, one to the middle, the other at the top, and on the inside of rods. Now take the circular board, thirteen inches in diameter, stand the five feet of screen wire on edge and tack securely to the edge of the board, lapping over the extra length and tacking securely. Take the annealed wire and lace closely the two edges of the wire screen at the point where

each reaches the body of the screen. When this is done, set the board with screen attached into the iron frame and screw the board fast to the iron rods from the bottom. Use again the annealed wire to secure the wire basket to the top hoop, but use it only as a support and to hold the basket in place. The wire should be passed through the meshes two or three inches from the top and up over the hoop and back, making the stitches not over one inch apart. This completes the basket, except that after the grain is in the other circular board (which should be provided with a hand hole) is placed in on top of the grain and should not fit close but be made loose enough to allow it to act as a float. In using this immersing basket the operator should not put in more than one bushel, or at most one and a half bushel at a time. This, with what water it takes up will make all the weight one man will want to handle. While it is in the water the basket should be raised and lowered a few times to give the water more complete circulation through the grain. We are at the present time experimenting on length of time necessary to submerge the grain. Fifteen minutes is ample time and from recent experiments the indications are that ten minutes will be quite as effective. It is necessary that the grain be spread upon the barn floor as soon as it is taken out of the water, so that it may be cooled as quickly as possible. Dipping in cold water would answer the same purpose, but the warm grain will dry more quickly than if cooled with cold water. It is not necessary to apply land plaster nor anything else to aid the grain in drying, but care must be exercised in giving all the air possible and frequently stirring or shoveling over. By this process one man has been able, on good drying days, to treat and dry twenty bushels of oats. We have treated grain so successfully in this way that it would not be possible for any one to tell that the grain had been wet, consequently the treating does not interfere in the least with the drilling.

The average farmer may not be able to get steam to do this work so conveniently, but the same end may be gained by using simply kettles and hot water, of course not forgetting the thermometer, and giving careful attention to the position of the mercury.

SUMMARY.

Varieties. (1). In a series of tests the following varieties have given the best results on this farm: Mealy, Red Fultz, Nigger, Geneva and New Monarch. The first two and last are bald and the other two are bearded varieties.

(2). Judging from our experience on this farm and the University farm at Columbus, we recommend the Valley wheat for the lower and and stronger loams of the state; Velvet chaff (Penquite's) for the black soils and the Poole, Mealy, Red Fultz, Nigger, Deitz and Rudy for the higher and especially the clay lands

(3) Neither the Rudy nor Nigger wheats are adapted to thin or wet lands.

(4) Varieties of wheat brought from the Northwest do not seem to do well on Ohio soils.

(5) Considering the bearded and smooth wheats in separate classes, but slight variations in average yields are found. Making a similar comparison of the Red and White wheats, nothing is found to indicate that either class, taken as a whole, gives better average returns than the other.

Cultural investigations. (1) Three successive crops, grown under adverse conditions, show that the heavier the seeding, under such conditions, up to ten pecks per acre, the better the yield.

(2) From experiments made up to date it is recommended to sow in Southern Ohio during the last week of September and the first week of October, but in Northern Ohio from ten days to two weeks earlier.

(3) Compacting the seed bed before drilling seems to be the better plan on the clay as well as on gravelly or more open soils.

(4) A single trial of cross drilling with the same quantity of seed did not give any higher yield than where it was drilled but one way.

(5) One trial of cross drilling, using three pecks one way and five the other gave less bushels per acre than six pecks drilled one way.

(6) Top dressing the wheat ground six weeks before seeding, added materially to the yield, above the same kind and amount of top dressing applied one week before seeding.

(7) Ground manured during the winter direct from the stable for corn and another piece manured just before plowing in the spring gave higher yields of oats from the earlier application of manure and lower yields of wheat following the oats.

(8) Slightly higher yields of wheat have followed the disking corn ground for oats than where the ground was plowed for oats, but that difference was more than overcome by a higher yield of oats from the plowed ground, and the lighter work of plowing again in the fall.

(9) The degeneration from sowing seed not selected is remarkably slow and not absolutely determined by our experiments thus far.

This page intentionally blank.